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Winter Barley in West Virginia

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Winter Barley in West Virginia

by R. O. Weibel*

WINTER BARLEY has been grown in the southern part of West Virginia for many years. Because of winterkilling it has not moved northward until recently. With the development and introduction of hardy varieties and with increased knowledge regarding seeding dates, winter barley has spread to practically all areas of the state suitable for growing small-grain crops. By selecting the right varieties and by using proper cultural practices, winter barley is a reasonably safe crop for all except the extreme northern counties and except the highest altitudes of the northern one-third of the state. Where adapted, it is replacing some of the acreage formerly planted to winter wheat or spring oats.

The number of acres planted to winter barley has increased steadily during the past few years. It is estimated that 12,000 acres were harvested in 1942 as compared to a 10-year average (1930-1939) of 3,000 acres.[1]

USES OF BARLEY

Feeding Value of Winter Barley

Barley is grown primarily as a feed for livestock in West Virginia. In many rations, it is considered a valuable substitute for corn. This is a decided advantage because barley ripens in early summer, when the supply of corn is usually getting low. In balanced rations barley serves principally as a source of carbohydrates. Although it is higher in protein than corn, it must be supplemented with a protein concentrate or with legume hay to obtain the best results. The barley kernel is very hard; to be fed satisfactorily it usually needs some previous preparation. Coarse grinding or cracking is the commoner treatment. Soaking it in water is sometimes practiced when feeding whole barley to swine. This makes the grain more efficient than when fed dry.[2] There is no advantage in soaking ground barley.

Barley can be fed to all classes of livestock,[3] but its popularity has increased most on the dairy farm, where, when ground, it is equal to ground corn. It produces firm flesh when fed to hogs, but its value as a hog feed depends on the quality of the grain. Badly scabbed barley is poisonous to hogs; low-test-weight or light barley has a high fiber content, is bulky, and therefore low in nutritive value. When cracked, barley is considered equal to oats as a feed for horses. For fattening cattle or sheep it is equal to corn in producing pounds of gain but does not put quite as good a finish on the animals. Barley does not have to be ground when fed to sheep.

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1. West Virginia Crop Reporting Service, Charleston, W. Va., Dec. 21, 1942.
2. Oklahoma Mimeographed Circular No. 28, 1939.
3. U.S.D.A. Farmers' Bulletin No. 1732, 1940.

TABLE I—Comparison of the estimated digestible nutrients of four cereal crops grown in West Virginia

Crop	Legal weight per bushel	Av. yield (1930-39)		Total digestible nutrients*	Digestible protein*	Yields comparable to T.D.N.** in 24.8 bu. of barley
		in bushels	in pounds			
	(lbs./bu.)	(bu./acre)	(lbs./acre)	(lbs./acre)	(lbs./acre)	(bu./acre)
Barley	48	24.8	1190.4	936.8	110.7	24.8
Corn	56	24.7	1383.2	1114.8	98.2	20.8
Oats	32	19.6	627.2	448.4	58.9	41.0
Wheat	60	15.0	900.0	752.4	101.7	18.7

* Based on feed tables in "Feeds and Feeding," by Morrison.
** T.D.N. = Total digestible nutrients.

A comparison of the average yields in West Virginia for four common feed crops is shown in Table 1. On the average, corn produces more pounds of grain per acre, as well as more pounds of total digestible nutrients, but not as much digestible protein as does barley or wheat. Barley produces more pounds of grain and more total digestible nutrients per acre than oats or wheat; it leads all four crops in the production of pounds of digestible protein per acre. The yields of corn, oats, and wheat necessary to produce an amount of total digestible nutrients equal to that produced in the average crop of barley are shown in column 7 of the table. This shows that the amount of total digestible nutrients produced in 24.8 bushels of barley is equal to that produced in 20.8 bushels of corn, or in 41.0 bushels of oats, or in 18.7 bushels of wheat.

Winter Barley as a Cover Crop

Winter barley makes an excellent cover crop to protect the soil against erosion during the winter months. It is a prolific stooler and covers the ground quickly. It may be seeded in corn at the last cultivation or it may be seeded by mid-September on a specially prepared seedbed.

Winter Barley as Fall and Spring Pasture

When seeded early in the fall, winter barley will supply considerable fall and spring pasture. Plants should be allowed to get at least three inches high before pasturing begins; care should then be taken that the animals do not graze it down too closely. Animals should be allowed on the fields only when the ground is dry and when there is sufficient top growth for the animals to obtain a fill without having to graze over too large an area. This is especially true if additional pasture is desired in the spring or if the crop is to be harvested for grain. Winter or early spring pasturing will reduce yields of grain unless there is excessive growth and unless grazing is carefully managed. Winter barley will not make as much late fall or winter pasture as will rye.

Winter Barley as a Nurse Crop

Barley is usually considered to be superior to wheat or oats as a nurse crop because it ripens earlier and is removed before it competes seriously with the small grass or legume plants. If it is to be used as a nurse crop, it should be seeded at about three-fourths the normal rate, or six pecks per acre. If seeded too thickly, it may cover the ground so completely that it prevents much of the legume or grass seed from reaching the ground; or it may smother many of the seedlings.

Other Uses of Winter Barley

Barley may be cut green and used as a soiling crop. Used in this way, it will furnish forage from two to three weeks before wheat or oats.

Barley straw is equal to oat straw in feeding value. There is some objection to feeding the straw from bearded varieties because of the discomfort the beards may cause to animals. Occasionally irritation of the mouth develops in feeding barley straw, but usually this has not been a serious factor.

GROWING WINTER BARLEY

Soil and Fertility Requirements

Barley produces the most satisfactory yields on fertile, well-drained soils having a silt loam texture.[4] Light sandy soils are poor barley soils because growth is not maintained at a sufficient uniform rate, and ripening is often hastened by drought. On the other hand, barley does poorly on heavy, wet soils and on soils that are strongly acid. It is the least acid-tolerant of the small grains. Soils selected for it should be limed to at least pH 6.0 (sufficiently for good growth of red clover). Where lime is needed it is best applied according to soil test at the time of seedbed preparation for the barley crop. The fertility requirements are about the same or perhaps a little higher than for wheat. Recommendations for fertilizer given in West Virginia War Circular 12 (revised) are as follows: On soils which have not received manure or have not had a legume turned under for the preceding crop, a 3-12-6 fertilizer (percent nitrogen, phosphoric acid, and potash, respectively) should be used. If seeded for grain alone, 200-250 pounds per acre is usually sufficient, but if a hay crop of grasses or legumes is to be seeded in the barley, more fertilizer is needed. Five to six hundred pounds is recommended when alfalfa is to be seeded in the barley. If manure has been applied or if a legume crop has been turned under, 20% superphosphate or equivalent should be applied at the rate of 150-200 pounds per acre if seeded to barley alone, or at the rate of 200-250 pounds if seeded to a hay crop other than alfalfa, or 400 pounds if alfalfa is to be seeded in the barley.

4. U.S.D.A. Yearbook, 1938.

Climate

Winter barley requires a cool, moist climate throughout its growing period. Hot, humid periods at heading time cause much sterility, resulting in fewer grains per head. Excessive moisture reduces the quality of mature barley very rapidly.

Seedbed Preparation

The seedbed for barley should be prepared far enough in advance to give it time to settle. With the exception of the surface few inches, it should be firm and smooth. A seedbed thus prepared can be seeded uniformly. Plowing is preferred to disking where barley follows corn or small grains, because it turns down the residues which might otherwise serve as hosts for scab organisms. Where barley follows soybeans, potatoes, or tobacco, a thorough harrowing with a disk or spring-tooth harrow is usually sufficient to destroy the residues so that they will not interfere with seeding operations.

TABLE 2—Date of seeding winter barley

Morgantown						Kearneysville	Lakin
Date Seeded	Date		Height	Spring survival	Yield 7-yr. av.	Yield 7-yr. av.	Yield 5-yr. av.
	Head	Ripe					
	(May)	(June)	(Inches)	(percent)	(bu./a.)	(bu./a.)	(bu./a.)
August 15	15	15	30	87	44.3	22.3	41.0
August 25	15	14	31	93	45.6	25.4	39.2
September 5	14	15	31	91	44.0	23.0	44.0
September 15	17	17	31	77	39.4	19.2	45.1
September 25	20	19	29	53	23.3	14.5	41.7
October 5	22	21	26	47	16.7	11.0	36.2
Difference for significance					5.7	5.4	5.7

Time and Rate of Seeding

Table 2 shows the average yields of barley at three locations in West Virginia when seeded at six dates ranging from August 15 to October 5. The three locations were Lakin in Mason County, Morgantown in Monongalia County, and Kearneysville in Jefferson County. Seedings at Lakin were made on river bottomland, while those at Morgantown and Kearneysville were made on upland soils. These data show little difference in yields from the early seedings, but yields drop sharply on seedings made after certain dates. The date at which this drop appears depends upon the climatic conditions of the particular locality. Results indicate that barley should be seeded on or before September 15 at Morgantown and Kearneysville and not later than September 25 at Lakin.

Variations in elevation make it difficult to give specific planting

dates for various parts of the state, but as a general rule it can be said that winter barley for grain should be seeded at least two weeks before the normal time of seeding wheat in any given location. This date is not later than September 15 for the lower altitudes of the northern one-third of the state or September 20 to 25 for the southern part of the state, depending on altitude. It should be seeded in time for the plants to reach a height of 3 or 4 inches before going into the winter. In some seasons, when ideal growing conditions continue until late, fall barley makes an excessive top growth and it may attempt to head. If this stage is reached, it should be grazed or clipped, for at this stage the hardiness is greatly reduced.

The normal rate of seeding for grain or pasture is two bushels per acre. A grain drill is most satisfactory for seeding because a more uniform rate and depth of seeding can be obtained. Occasionally when bearded barley has not been properly threshed or cleaned, beards may be troublesome in drilling. If such is the case, care should be taken to see that the drill is seeding at the proper rate. Barley should be seeded about 1½ inches deep.

Harvesting

Harvesting and threshing methods are about the same as for wheat. Barley should be cut before it is dead ripe. It is easier to handle at this stage and there is much less danger of loss due to shattering and lodging. The bundles should be thoroughly cured and dried in the shock, stack, or barn. This is especially true when threshing the bearded types as it is very difficult to do a good job of removing the beards when they are damp and tough. It should not be threshed until it is dry enough to store without heating.

DISEASES AND THEIR CONTROL[5]

Loose smut (Ustilago nuda and Ustilago nigra), covered smut (Ustilago hordei), scab (Gibberella saubinetii) and powdery mildew (Erysiphe graminis hordei) are diseases of winter barley which frequently do considerable damage in West Virginia. Stripe (Helminthosporium gramineum) and leaf rust (Puccinia anomala) may cause reduced yields in some seasons but are usually not so serious.

Loose smut makes its appearance at heading time. The kernels are replaced by black, powdery spores which are readily dispersed by wind or rain. These spores, carried from diseased heads, infect healthy ones. The newly infected heads produce kernels which to all outward appearances are sound, but they serve as carriers for the next crop. Two kinds of loose smut are now known to infect barley, namely, black loose smut (Ustilago nigra) and brown loose smut (Ustilago nuda). The first can be controlled by a mercury dust such as New Improved Ceresan, but the second requires a hot-water treatment. This treatment to be effective requires a definite procedure and certain equip-

5. For additional information in regard to barley diseases, seed treatment, and equipment see: W. Va. Circ. 324, U.S.D.A. Misc. Pub. 199, and U.S.D.A. Misc. Pub. 330.

ment. Because of the injury to germination that may result from too high a temperature, the hot-water treatment must be controlled carefully and is not recommended for general use by farmers.

Covered Smut, like loose smut, destroys the heads of the plant. It differs in that the black, powdery spores are enclosed in a thin membrane. The spore mass usually remains intact until broken by the threshing machine. The spores are then spread to healthy kernels, where they adhere to the seed coat. Unless removed or killed by seed treatment, these spores are planted with the seed and there infect the barley seedling. This disease can be controlled by treating the seed with New Improved Ceresan, which is very effective in killing the spores on the seed.

Scab, sometimes called head blight and seedling blight, is most noticeable when it attacks the head. The infected areas turn brown and may die prematurely. The kernels are usually badly shriveled and discolored. The disease may attack young seedlings and cause blighting. Scab, unlike the smuts of barley, is not confined to barley alone, but also attacks corn and other small grains and is carried over from one year to another on residues from these crops, especially on corn stubble, as well as on the seed of the barley. The mercury dust New Improved Ceresan, acting as a seed disinfectant and protectant, will control the seedling blight but does not affect the head blight. To control the latter, all previous crop residues which might serve as a host must be plowed under or destroyed, and the seed must be disease-free. When scab has been serious, barley should not be planted after corn, barley, or wheat.

Mildew makes its most noticeable appearance in the fall and during early stages of spring growth. It appears as a white, powdery growth which forms on the leaves and stems and causes premature death of the infected parts. This reduction in leaf surface results in reduced yields of grain and lowers the value of the barley plants for pasture. No practical control measure can be recommended. The development of resistant strains offers the greatest promise of control at present.

Barley stripe can be identified about heading time by the long, yellow-to-brown stripes on the leaves of stunted plants. Plants may head, but usually the infected plants produce little sound seed. They may die completely before harvest time. This disease does not do as much damage as those mentioned above. New Improved Ceresan offers effective control.

Leaf rust attacks mainly the leaves of the plant and is identified by the small, round pustules of reddish spores. The plant suffers from reduced leaf surface, which results in reduced yields and lower-quality grain. This disease has reduced yields on early seedings at the Kearneysville Experiment Farm but as a rule is not very serious over the state as compared to the first four diseases considered above. No control measure can be recommended, since the disease has several other host plants and is carried over from year to year on volunteer plants, new

seedings, grasses, and other cereal-crop plants. Breeding resistant strains gives some promise of control.

While several diseases have been considered and each may in certain seasons cause serious losses, practical control measures in the form of cultural sanitation and seed treatments are effective in reducing these losses to a tolerable degree.

Winter Barley in the Rotation

In using winter barley in a rotation with other crops, there are several things that must be considered in planning the rotation. First, barley is susceptible to scab. In areas where scab is serious it should not follow corn or other small grains; nor should manure be applied just before the crop is planted. Where winter barley does follow these crops, the ground should be carefully prepared to turn under all crop residue, which may serve as a carrier for the disease organisms. Second, because winterkilling is more likely to be serious if the crop is planted too late, the rotation must be managed to allow for planting early enough to get plants well established in the fall. Third, barley is not as acid-tolerant as wheat; hence the ground should be limed enough to grow good crops of red clover if good results are to be obtained.

The following rotations are suggested:

Rotation	1st year	2nd year	3rd year or more
1	Corn—harvested early or cut for silage	Winter barley—with clover and timothy or alfalfa	Clover and timothy or alfalfa for 1 or more years
2	Early potatoes	do.	do.
3	Soybeans—cut for hay	do.	do.
4	Tobacco	do.	do.
5	Corn—followed by cover crop	Soybeans for hay, followed by winter barley	Winter barley, followed by clover and timothy or alfalfa

Rotation No. 1 is probably the one most commonly followed. Since barley has replaced wheat acreage, it is natural that it should fall in the same places in the rotation. Since there is danger of scab disease in this rotation, care should be taken to turn under completely the corn stubble and other crop residue, which may serve as a carrier from one season to the next. Manure or heavy applications of complete fertilizers should not be applied at barley-seeding time because of the danger of scab from the manure and because of overstimulation of plant growth from the nitrogen in the manure or fertilizer. In this rotation the manure applied to the land should be plowed under for corn. Lime should be applied as needed for barley and clover during seedbed preparation for the barley.

Rotation No. 2 applies only to those areas producing early potatoes. Under these conditions barley follows the potatoes, serving both as a winter cover and as a grain crop the following year. If potatoes have received a liberal amount of fertilizer, the amount of fertilizer to apply

for barley can be reduced. Lime should be applied as needed before the barley is seeded. This is a very satisfactory rotation where it can be used.

Rotation No. 3 has a rather limited usage in that soybeans are in many cases not depended upon as a hay crop every year, but rather as emergency hay crops and usually on small acreages. Where soybean hay is desired each year, this rotation works very well. It is especially well suited to the dairy farm, where hay or silage is so important.

Rotation No. 4 is applicable only to a limited area because of the small commercial acreage of tobacco. However, it is a satisfactory rotation from the standpoint of growing winter barley and tobacco. Tobacco normally receives heavy applications of fertilizer, with the result that the amount applied to the barley can be reduced. Lime should be applied as needed at the time of preparing the seedbed for barley.

Rotation No. 5 is a rotation which should be restricted to level land. It is a longer rotation than the others mentioned, and the ground has to be plowed twice, before corn and before soybeans, as compared with single plowing in the other rotations listed. However, it is applicable where there is need for soybean hay and where corn is normally too late in maturing to be harvested in time to get barley seeded.

These rotations do not take into consideration all of the cropping practices in the state. However, rotation No. 1 can be used wherever barley is adapted. Barley can be substituted for other fall-sown small grains in any rotation provided it is seeded early enough in the fall. These rotations become three, four, or five-year plans depending upon the length of time the legume or meadow mixture is allowed to remain. They have the qualifications of a good rotation in that they furnish a cash crop, a feed or small-grain crop, and a sod or hay crop, and they provide for a legume on the land at least once every three years.

VARIETIES IN GENERAL

Types of Winter Barley

The varieties of winter barley tested can be classified into three groups according to the head type, namely: (1) bearded with rough or barbed beards, "rough-awned," (2) bearded with smooth beards, "smooth-awned," and (3) hooded. These types are shown in Figure 1. The rough-awned types are the most widely grown of these groups. The average yields of the rough-awned types have been higher than those of the smooth-awned types, and both yield and quality have been better than those of the hooded types. Comparative yields of the three types are shown in Table 3. In these trials the same bearded varieties were compared to the same hooded varieties at the several locations. Despite the lower yield and quality of "smooth-awned" and "hooded"

types, some growers prefer them because they can be handled and threshed with less discomfort.

Bearded (Rough) Bearded (Smooth) Hooded (Beardless)

Fig. 1—Types of Winter Barley

Range in Maturity

Agronomic data which are helpful in determining the adaptation and value of the varieties are shown in Table 4. These data were obtained from the tests at Morgantown. The average date of maturity ranged from June 12 for the earliest varieties to June 20 for the latest, with most of the varieties tested maturing on or before June 15. These data are averages, and the date of maturity of any variety may vary from early to late June, depending upon the season. While this information was obtained at Morgantown and the date of maturity may be earlier farther south, or later to the north at higher elevations, differ-

TABLE 3—Average yields of bearded (rough), bearded (smooth), and hooded types of winter barley at three locations in West Virginia

Location	Average yield 1942-43		
	Bearded		Hooded
	Rough-awned	Smooth-awned	
	Av. of 4 var.	Av. of 2 var.	Av. of 4 var.
	(bu./a.)	(bu./a.)	(bu./a.)
Morgantown	44.2	34.7	38.2
Lakin	42.5	34.4	36.5
Arthurdale	34.7	26.0	27.0
Average	40.5	31.7	33.9

ences between the varieties will remain about the same wherever grown.

Hardiness

The word "hardiness" refers to the ability of the plant to live through the winter. This means to survive not only low temperatures but also soil heaving because of freezing and thawing when wet. For the most part, winterkilling in West Virginia has been due to soil heaving. This action breaks the roots, leaving the tops without support. When good stands with a top growth of three to six inches have been established, there is less danger from heaving than when stands are thin or plants poorly established.

There are times when the plants are killed directly by low temperatures, especially when low temperatures with no snow cover to protect the plants follow a week or so of mild weather.

Occasionally in West Virginia, especially in the higher altitudes, winter barley is injured by late spring freezes. It is the first of the small grains to start heading, and should a hard freeze occur after the head is well up in the boot, the plant usually fails to set seed. At Arthurdale in Preston County in 1941, late frosts on May 12, 13, and 14 caught the barley in early heading stage. Nearly complete killing resulted. Many plants continued to head but they failed to set seed. Other plants were injured so badly that they failed to recover sufficiently to continue growth.

The data on spring survival given in Table 4 show that, with the exceptions of Maryland Smooth Awn, Nobarb, and Hooded #16, all the varieties have shown at least 75 percent spring survival. Although these three varieties have been tested for only three, two, and two years, respectively, the low spring survival indicates that they are not hardy enough for the conditions at Morgantown. With the one exception of the variety Orel, differences in hardiness between the varieties tested for five years or more are not sufficient to justify a choice between them.

TABLE 4—Agronomic data for varieties of winter barley grown at Morgantown

Variety	W. Va. No.	Head type	No. of years tested	Date		Spring survival	Height	Lodging[3] (1941)
				Headed	Ripe			
				May	June			
						(percent)	(inches)	
Scottish Pearl	28	Bearded	9	14	14	92	34	2
Kentucky #1	16	Bearded	9	20	20	98	37	3
Kentucky #2	17	Bearded	9	15	13	95	34	1
Union	2	Bearded	9	14	12	90	32	1
Kentucky #11	15	Bearded[1]	9	17	18	96	37	3
Han River	18	Bearded	7	15	12	89	32	2
North Carolina Hooded	20	Hooded	9	13	14	87	36	4
Tennessee Winter #52	21	Bearded	9	15	14	87	33	2
Tennessee Winter	22	Bearded	7	14	14	91	34	2
Pidor	27	Bearded	7	14	14	91	32	2
Tennessee #6	25	Hooded	9	16	18	93	38	2
Tuckwiller	31	Bearded	9	15	13	94	33	1
Folk	32	Bearded	7	15	15	96	33	2
Orel	23	Bearded[2]	7	21	20	80	34	1
Wisconsin Winter	26	Bearded	7	15	15	91	33	1
W. Va. Sel. #I-34-127	44	Bearded	9	12	13	94	31	4
W. Va. Sel. #I-35-274	43	Hooded	8	18	18	98	32	5
Esaw	24	Bearded	6	14	13	92	33	1
Tennessee #5	13	Hooded	6	17	15	90	37	2
Alaska	19	Bearded	6	14	12	89	32	2
Poland	36	Bearded	5	14	13	95	33	4
Missouri Early Beardless	37	Hooded	5	12	13	96	32	5
Maryland Smooth Awn	38	Bearded[1]	3	10	15	45	29	1
Nobarb (Marnobarb)	33	Bearded[1]	2	15	20	73	33	0
Wong	46	Bearded	2	16	19	75	30	0
Smooth Awn #86	41	Bearded[1]	3	11	17	76	32	0
Hooded #16	45	Hooded	2	11	18	56	28	0

1—Bearded but beards are smooth, not barbed.
2—Two-row type; all others are six-row.
3—0 to 5 = "no lodging" to "completely lodged."

Height and Lodging

The range in average height for the varieties tested was from 29 inches for Maryland Smooth Awn to 38 inches for Tennessee Beardless #6. Height, of course, varies with the soil and the season, but during the seasons in which the trials were conducted, all varieties reached a height sufficient to be harvested with the grain binder.

Lodging was recorded in only three years out of nine at Morgantown. In 1940 the season was ideal, and the varieties were growing on soil which had had a heavy crop of soybeans turned down before the barley seeding in the fall. As a result, excessive growth along with heavy rains and some wind caused many varieties to lodge. Some varieties such as Kentucky #2, Tuckwiller, and Wisconsin Winter, however, stood very well until maturity. The relative lodging of the varieties for the 1941 season is shown in Table 4. Regardless of the season, when mature all the varieties tested tend to stubble-fall or break over rapidly.

Fig. 2—Location of Barley Yield Trials in West Virginia

RESULTS OF YIELD TRIALS

Yield trials were conducted at six locations (see Fig. 2) in West Virginia, namely: Morgantown, Monongalia County; Lakin, Mason County; Kearneysville, Jefferson County; Arthurdale, Preston County; in Pocahontas County near Marlinton; and in Greenbrier County near Lewisburg.

During the past 9 years, 27 varieties or selections have been tested two or more years in one or more of these locations. Some varieties have been in the yield trials for the full period. Others have been discontinued because they have not proved worthy of further testing. At the same time, new varieties or selections have been added to the trials. The new varieties are usually put in the trials at Morgantown first. Should they prove definitely not suited to West Virginia conditions, they are not tested at any other location. This means a variation in the number of years during which the varieties have been tested. However, where average yields are reported in the following tables they are compared, in percentage, to the average yields of Scottish Pearl for the same years. Scottish Pearl is used as the standard; and all other varieties or strains are compared to it.

All yield trials have been conducted similarly insofar as experimental method is concerned. Each variety was planted in a 3-row plot 18 feet long with the rows 1 foot apart. At harvest time, 16 feet of the center row was harvested for yield determinations. Each variety was replicated; hence yields reported are the average of four plots for each season at each location. All plots were harvested by hand and threshed and weighed separately. An average yield was then calculated from the individual plot weights.

Average yields of the more important varieties are given in the tables accompanying the discussion of results. For complete lists of varieties tested and their yields by seasons, the appendix may be consulted.

TABLE 5—Average yields of the winter barley varieties* grown at Morgantown during the nine-year period 1935-43

Variety	Years tested	Average yield	Relative yield**
		(bu./acre)	(percent)
Rough-bearded types			
Scottish Pearl	9 (1935-43)	45.6	100
Kentucky #1	9 (1935-43)	44.6	98
Kentucky #2	9 (1935-43)	43.4	95
Tuckwiller	9 (1935-43)	43.2	95
Union	9 (1935-43)	41.2	90
Tennessee Winter #52	9 (1935-43)	40.1	88
Wong	2 (1942-43)	38.3	78
Smooth-bearded types			
Kentucky #11	9 (1935-43)	39.4	86
Smooth Awn #86	3 (1941-43)	34.6	84
Hooded types			
North Carolina Hooded	9 (1935-43)	38.6	85
Tennessee #6	9 (1935-43)	34.2	75
Missouri Early Beardless	5 (1939-43)	42.2	92

* Only those varieties grown in 1943 are shown in this table. For a complete list of varieties grown and their yields by seasons see Appendix, Table 10.

** Relative yield expressed in percentage of Scottish Pearl for the same years.

Yields of Winter Barley at Morgantown

The average yields of the varieties of winter barley tested at Morgantown are shown in Table 5. The average yield of each is compared, in percentage, to the average yield of Scottish Pearl for the same years. A complete list of the varieties tested and their yields by seasons is shown in Table 10 of the appendix.

In the "rough-awned" group, six varieties have been tested for 9 years. Scottish Pearl has produced the highest average yield during this period. Its yielding ability has been consistent and it has never ranked very low in any season. Kentucky #1 ranked second for this period. However, it is not quite so consistent. Tennessee Winter #52 is the lowest-ranking variety for the 9-year period, but the difference of 5.5 bushels between it and Scottish Pearl is not significant. Wong is a new variety from New York which has good straw, also resistance to mildew and aphid (plant lice). The average yield of Wong for the 2-year period was lower than that of Scottish Pearl. However, further testing is necessary to determine whether or not the desirable characteristics will enable it to outyield Scottish Pearl during seasons when mildew, aphids, or lodging is serious.

In the "smooth-awned" group, Kentucky #11 has been tested for 9 years with yields averaging 6.5 bushels per acre less than Scottish Pearl for the same period. Smooth Awn #86 has been tested only three seasons and while the average yield is considerably lower than Scottish Pearl, it has yielded slightly higher than Kentucky #11 during those three seasons. It is more aphid-resistant and leaf-rust-resistant than Kentucky #11.

In the hooded group two varieties, North Carolina Hooded and

TABLE 6—Average yields of the winter barley varieties* grown at Lakin during the eight-year period 1934-35 and 1938-43

Variety	Years tested	Average yield	Relative yield**
		(bu./acre)	(percent)
Rough-bearded types			
Scottish Pearl	8 (1934-35 and 1938-43)	47.9	100
Kentucky #2	8 (1934-35 and 1938-43)	47.2	98
Kentucky #1	8 (1934-35 and 1938-43)	44.4	93
Union	8 (1934-35 and 1938-43)	44.4	93
Tuckwiller	8 (1934-35 and 1938-43)	44.4	93
Tennessee Winter #52	8 (1934-35 and 1938-43)	43.3	90
Wong	2 (1942-43)	35.6	83
Smooth-bearded types			
Kentucky #11	7 (1934-35, 1938-40, and 1942-43)	37.1	78
Smooth Awn #86	2 (1942-43)	34.3	80
Hooded types			
North Carolina Hooded	8 (1934-35 and 1938-43)	40.8	85
Tennessee #6	8 (1934-35 and 1938-43)	34.5	72
Missouri Early Beardless	4 (1940-43)	46.7	95

* Only those varieties grown in 1943 are shown in this table. For a complete list of varieties grown and their yields by seasons see Appendix, Table 11.

** Relative yield expressed in percentage of Scottish Pearl for the same years.

Tennessee #6, have been tested 9 years. Both have yielded considerably less than Scottish Pearl. Tennessee #6 is more desirable than North Carolina Hooded because of its superior straw strength, even though its average grain yield is lower. Missouri Early Beardless for the 5-year period (1939-1943) has outyielded the other hooded types and compares more closely with the yields obtained with the bearded types. While the straw is somewhat better than North Carolina Hooded, it is not as good as Tennessee #6.

Yields of Winter Barley at Lakin

Average yields for the varieties grown at Lakin are shown in Table 6. In general the results are similar to those at Morgantown. Yields were higher, since the experiments were conducted on river bottomland, and better results are to be expected under these conditions. Scottish Pearl produced the highest average yields but only by a slight margin over Kentucky #2. The yields of Kentucky #2 have been consistent and have been higher than Scottish Pearl on 4 of the 8 years. One exception to the similarity of the yields at Morgantown is the response of Kentucky #2 as compared with Kentucky #1. At Morgantown there were early seasons which favored Kentucky #2, and it gave higher yields in 4 of the 9 years. However, for the other seasons the differences, in favor of Kentucky #1, were greater. At Lakin, Kentucky #2 has produced higher yields than Kentucky #1 in 7 out of 8 seasons. The relative yields of all other varieties shown in Table 6 are in line with the results obtained at Morgantown. Again the "rough" bearded types have given higher yields than either the "smooth" bearded or the "hooded" types. However, Missouri Early Beardless has given a good yield record for the four years of testing.

TABLE 7—Average yields of the winter barley varieties* grown at Kearneysville during the nine-year period 1933, 1935-41, and 1943

Variety	Years tested	Average yield	Relative yield**
		(bu./acre)	(percent)
Rough-bearded types			
Scottish Pearl	9 (1933, 1935-41 and 1943)	24.9	100
Kentucky #2	9 (1933, 1935-41 and 1943)	25.2	101
Tennessee Winter #52	9 (1933, 1935-41 and 1943)	24.5	98
Kentucky #1	9 (1933, 1935-41 and 1943)	24.4	98
Union	9 (1933, 1935-41 and 1943)	23.0	92
Wong	1 (1943)	21.4	90
Smooth-bearded types			
Kentucky #11	8 (1933, 1935-40, and 1943)	24.1	97
Smooth Awn #86	1 (1943)	30.1	126
Hooded types			
North Carolina Hooded	9 (1933, 1935-41 and 1943)	20.0	80
Tennessee #6	9 (1933, 1935-41 and 1943)	18.9	76
Missouri Early Beardless	3 (1940-41 and 1943)	15.2	73

* Only those varieties grown in 1943 are shown in this table. For a complete list of varieties grown and their yields by seasons see Appendix, Table 12.
** Relative yield expressed in percentage of Scottish Pearl for the same years.

Yields of Winter Barley at Kearneysville

The average and relative yields of the winter barley varieties grown at Kearneysville are shown in Table 7. The results here, as far as varietal differences go, are somewhat different from those of the previously discussed locations. The main differences are higher comparative yields of Tennessee Winter #52 (as compared with Scottish Pearl) and lower yields of the hooded types, especially of Missouri Early Beardless. Tennessee Winter #52 is a popular variety in the Eastern Panhandle section. The variety Smooth Awn #86 has only 1 year's record, and, although it has yielded well at other locations, the yield here would seem out of line. However, this can be at least partially accounted for by the fact that it is resistant to aphid attack, and there was a heavy attack of aphids or plant lice in the fall of 1942. Missouri Early Beardless is very susceptible to leaf rust and mildew and these diseases were prevalent at this location 2 out of 3 seasons tested. This fact accounts for its low record as compared with Lakin and Morgantown.

Yields of Winter Barley at Arthurdale

Average and relative yields of the varieties of winter barley grown at Arthurdale are shown in Table 8. The trials at this location have been conducted in most seasons on soils which have had a low pH. This has caused lower average yields than should otherwise be expected. Leaf rust has been a factor in nearly every season, and as the varieties tested were all similar in their susceptibility, the yields were uniformly reduced. Barley failed in 1939 as a result of winterkilling and acid soil. The crop also failed in 1941 because of killing freezes on three

TABLE 8—Average yields of the winter barley varieties* grown at Arthurdale during the six-year period 1936-38, 1940, and 1942-43

Variety	Years tested	Average yield	Relative yield**
		(bu./acre)	(percent)
Rough-bearded types			
Scottish Pearl	6 (1936-38, 1940, 1942-43)	26.9	100
Tennessee Winter #52	6 (1936-38, 1940, 1942-43)	24.9	92
Kentucky #1	6 (1936-38, 1940, 1942-43)	23.6	88
Kentucky #2	6 (1936-38, 1940, 1942-43)	21.2	79
Union	6 (1936-38, 1940, 1942-43)	21.2	79
Tuckwiller	6 (1936-38, 1940, 1942-43)	20.4	76
Wong	2 (1942-43)	23.4	62
Smooth-bearded types			
Kentucky #11	6 (1936-38, 1940, 1942-43)	16.1	60
Smooth Awn #86	2 (1942-43)	26.7	71
Hooded types			
North Carolina Hooded	6 (1936-38, 1940, 1942-43)	22.4	83
Tennessee #6	6 (1936-38, 1940, 1942-43)	19.8	74
Missouri Early Beardless	8 (1940 and 1942-43)	26.9	78

* Only those varieties grown in 1943 are shown in this table. For a complete list of varieties grown and their yields by seasons see Appendix, Table 13.
** Relative yield expressed in percentage of Scottish Pearl for the same years.

successive nights—May 12, 13, and 14. All varieties were developing normally and were in early stages of heading when injured. Some plants were killed immediately. Others attempted to send up late heads but they were completely sterile.

The variety Scottish Pearl is the highest ranking for the 6-year period, with Tennessee Winter #52 a rather close second. Varietal response is very similar to that obtained at other locations, and no one variety seems better adapted than any other for this location.

Yields of Cooperative Farm Trials

The cooperative farm trials were conducted on selected plots within fields seeded to winter barley by the cooperating farmer. These trials were conducted in Pocahontas County near Marlinton in 1938 and 1939 and in Greenbrier County near Lewisburg in 1941 and 1942.

Average yields for the varieties grown in the cooperative trials are shown in Table 9. No one variety was particularly outstanding in these trials. Scottish Pearl, Tennessee Winter #52, and Kentucky #2 were consistent, indicating their adaptability here. This was shown also in tests at other locations. The average yields for the "smooth" bearded and the "hooded" types are again lower than for the "rough" bearded types.

RECOMMENDATIONS

Here follows a brief description of the more important varieties which have been discussed under the results at the various locations.

TABLE 9—Average yields of the winter barley varieties* grown in farmer cooperative trials during the four-year period 1938-39 and 1941-42

Variety	Years tested	Average yield	Relative yield**
		(bu./acre)	(percent)
Rough-bearded types			
Scottish Pearl	4 (1938-39, 1941-42)	37.1	100
Tuckwiller	4 (1938-39, 1941-42)	38.5	104
Tennessee Winter #52	4 (1938-39, 1941-42)	37.1	100
Kentucky #2	4 (1938-39, 1941-42)	36.5	98
Union	4 (1938-39, 1941-42)	36.3	98
Kentucky #1	4 (1938-39, 1941-42)	32.5	88
Wong	1 (1942)	19.1	75
Smooth-bearded types			
Kentucky #11	3 (1938-39 and 1942)	29.9	78
Smooth Awn #86	1 (1942)	23.4	91
Hooded types			
North Carolina Hooded	4 (1938-39, 1941-42)	29.8	80
Tennessee #6	4 (1938-39, 1941-42)	29.7	80
Missouri Early Beardless	2 (1941-42)	24.3	83

* Only those varieties grown for the four-year period or because of special interest are shown in this table. For a complete list of the varieties grown and their yields by seasons see Appendix, Table 14.

** Relative yields expressed in percentage of Scottish Pearl for the same years.

"Rough" Bearded Types

Recommended for West Virginia

Scottish Pearl, a bearded type, seems to be quite well adapted wherever tested and has given good yields consistently. It is medium in maturity and height. The straw is fairly good although on fertile soils in good seasons it is apt to lodge. This variety is somewhat susceptible to smut, but its yielding ability overshadows that fault.

Kentucky #1 and #2 are hardy, bearded types originating by selection at the Kentucky Agricultural Experiment Station. Kentucky #1 averages about 3 inches taller and a week to 10 days later in maturity. Both are good yielders and seem to be adapted to all areas were tested. Where danger of winterkilling is common, these offer the best possibilities. Where earliness is needed because of high temperatures early in the season, Kentucky #2 is more desirable than Kentucky #1.

Tennessee Winter #52, a bearded selection, is medium in maturity and medium in height. It yields well, is a prolific stooler, and is especially adapted to rich or medium rich soils. It is moderately susceptible to smut, but its good qualities outweigh this. It is well adapted to barley-growing areas of West Virginia but seems to yield best in the eastern part of the state, especially in the Eastern Panhandle.

Good but not recommended

Union, a bearded type, is a day or two earlier, a little shorter, and has weaker straw than Scottish Pearl. The yields of Union have been good, but they have not averaged as high as those varieties mentioned above, and since it does not have any particular advantages, it is not recommended for West Virginia.

Tuckwiller, a bearded type, is a typical Tennessee winter type with characteristics similar to those of Tennessee Winter #52. This variety is a selection made from a field of unnamed barley in Greenbrier County. Because of its similarity to Tennessee Winter #52 and also to Scottish Pearl, and because it does not yield significantly higher at any location, it is not recommended.

Wong is a bearded type but one on which the beards are very short. The heads are very compact, the straw is stiff, and it has considerable resistance to mildew and smut. It is not as hardy, nor has it yielded as well as Scottish Pearl in the tests thus far conducted. Wong is a selection from a cross developed at the New York Agricultural Experiment Station. It has proved very sucessful in some states.

Smooth-Bearded Types

The best smooth-bearded types tested are listed. These are not recommended for West Virginia at the present time.

Kentucky #11, a smooth-bearded type, is about the same in height and maturity as Kentucky #1 but is not as hardy. The

straw is only fair. In years of little winterkilling and late springs it has yielded well, but it is not recommended over the rough bearded types.

Smooth Awn #86, a smooth-bearded type, is very similar to Kentucky #11 in growth habit but not quite so hardy. It apparently carries mildew resistance and resistance to aphid or plant lice attack. Yields thus far have been equal to or better than Kentucky #11. It needs further testing before it can be recommended by the Experiment Station.

Hooded Types

None of the hooded (beardless) types tested was equal in average yielding ability to the better rough bearded types. It is only where hooded types are desired because of the added comfort in handling that they should be recommended.

Recommended for West Virginia

Tennessee #6 is the hooded type with a fairly stiff straw. It is more winterhardy than North Carolina Hooded but not as hardy as Scottish Pearl. It is about the same as Scottish Pearl in date of maturity but is a little taller. It is quite susceptible to smut. Because of its better strength of straw it is one of the recommended varieties where hooded types are desired.

Missouri Early Beardless is a hooded early-maturing type. It is medium in height, has a weak straw, and is very susceptible to smut and mildew. It is more winterhardy than Tennessee #6 and about the same in this respect as Scottish Pearl. With the exception of the Kearneysville trials, it has been slightly superior in yield to other hooded types. Because of its hardiness and yield it is one of the recommended hooded types for West Virginia.

Good but not recommended

North Carolina Hooded is a hooded type which has, under experimental conditions and compared with other hooded types, produced favorable yields of grain. It is of about the same height and maturity as Scottish Pearl. However, it has a very weak straw and is susceptible to disease, especially to mildew. Because of these faults it is not recommended for West Virginia.

APPENDIX

TABLE 10—Yields per acre for varieties of winter barley grown at Morgantown for all or part of the period 1935-43

C.I. No.	Variety	W. Va. No.	Head type*	Years tested	Av. yield	Rel. for years grown**	1935	1936	1937	1938	1939	1940	1941	1942	1943
					(bu.)	(percent)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)
277	Scottish Pearl	28	B	9	45.6	100	48.0	45.7	40.4	46.1	39.1	67.2	25.6	53.8	44.5
6050	Kentucky #1	16	B	9	44.6	98	54.5	40.6	47.8	61.8	29.0	64.2	24.3	41.4	37.9
6148	Kentucky #2	17	B	9	43.4	95	43.5	34.5	36.2	49.4	32.3	73.2	25.7	47.2	49.0
583	Union	2	B	9	41.2	90	48.4	33.0	27.7	49.8	36.0	70.2	25.9	34.0	46.0
6021	Kentucky #11	15	B1	9	39.4	86	50.8	34.6	31.9	48.7	29.8	65.0	28.3	38.3	27.1
2163	Han River	18	B	7	39.4	88	42.0	33.5	30.1	45.2	35.9	65.4	23.6	–	–
5951	North Carolina Hooded	20	H	9	38.6	85	43.7	34.7	25.8	34.4	41.5	59.2	32.1	37.4	39.1
3543	Tennessee Winter #52	21	B	9	40.1	88	44.1	35.7	27.6	45.0	33.5	71.6	20.4	41.1	41.9
257	Tennessee Winter	22	B	7	38.5	86	44.0	34.9	30.4	43.8	31.4	58.9	26.2	–	–
901	Pidor	27	B	7	42.8	96	44.7	38.0	31.4	45.4	35.3	72.0	32.6	–	–
2746	Tennessee #6	25	H	9	34.2	75	31.5	31.3	26.9	30.3	27.3	53.8	24.0	40.8	41.6
	Tuckwiller	31	B	9	43.2	95	42.7	36.5	32.2	52.6	35.0	68.8	30.8	39.6	50.5
	Folk	32	B	7	42.8	96	47.8	36.8	38.2	49.2	29.8	69.9	27.9	–	–
351	Orel	23	B	7	31.8	71	32.8	28.1	28.1	45.2	26.1	50.1	12.8	–	–
2159	Wisconsin Winter	26	B	7	40.1	90	34.4	37.0	32.7	50.0	33.4	72.1	21.0	–	–
	W. Va. Sel. #I-34-127	44	B	9	55.6	122	65.0	82.3	53.3	41.5	49.9	73.1	42.3	45.2	48.3
7039	W. Va. Sel. #I-35-274	43	H	3	44.5	98	–	43.1	65.7	40.2	45.4	60.8	32.1	34.6	34.2
4690	Esaw	24	B	6	36.6	90	51.5	32.9	29.6	49.5	30.5	–	25.7	–	–
3384	Tennessee #5	13	H	6	27.9	68	26.3	30.4	32.5	26.3	25.7	–	26.3	–	–
4106	Alaska	19	B	6	35.1	86	54.7	32.5	28.7	45.1	28.4	–	21.5	–	–
6280	Poland	36	B	5	46.4	106	–	–	49.9	50.9	35.0	66.4	29.6	–	–
6051	Missouri Early Beardless	37	H	5	42.2	92	–	–	–	–	45.6	50.4	36.9	39.0	39.0
	Maryland Smooth Awn	38	B1	3	36.5	83	–	–	–	–	25.1	63.2	21.1	–	–
6120	Nobarb (Marnobarb)	33	B1	2	24.4	57	–	26.2	22.7	–	–	–	–	–	–
6268	Smooth Awn #86	41	B1	3	34.6	84	–	–	–	–	–	–	30.1	46.5	27.2
	Hooded #16	45	H	2	23.4	59	–	–	–	–	–	–	10.8	36.0	–
6728	Wong	46	B	2	38.3	78	–	–	–	–	–	–	–	33.7	42.9

* Head type; B = bearded (rough); B1 = bearded (smooth beards); H = hooded (smooth).
** Expressed in percentage of Scottish Pearl grown for the same years.

TABLE 11—Yields per acre for varieties of winter barley grown at Lakin for all or part of the period 1934-43*

Variety	W. Va. No.	Head type**	Years tested	Av. yield	Rel. for years grown***	1934	1935	1938	1939	1940	1941	1942	1943
				(bu.)	(percent)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)
Scottish Pearl	28	B	8	47.9	100	68.5	31.7	49.9	37.3	61.4	49.1	49.6	86.0
Kentucky #1	16	B	8	44.4	93	51.9	33.9	46.3	31.9	55.9	54.5	44.7	36.1
Kentucky #2	17	B	8	47.2	98	57.4	40.6	53.1	34.9	58.5	50.0	45.3	37.7
Union	2	B	8	44.4	93	47.2	36.8	53.2	37.5	59.5	46.8	39.0	85.6
North Carolina Hooded	20	H	8	40.8	85	40.2	21.4	50.4	40.1	50.8	52.2	44.3	27.0
Tennessee Winter #52	21	B	8	43.3	90	55.0	33.4	49.9	33.4	54.8	44.3	38.3	37.6
Pidor	27	B	6	50.7	102	63.2	36.8	56.7	36.2	54.9	56.6	–	–
Tennessee #6	25	H	8	34.5	72	41.9	18.2	28.1	32.9	49.8	43.4	39.1	22.7
Tuckwiller	31	B	8	44.4	93	54.0	38.9	49.9	31.5	55.0	45.7	45.1	85.4
Kentucky #11	15	B1	7	37.1	78	35.7	29.6	41.2	36.4	47.7	–	41.1	28.0
Han River	18	B	5	44.7	90	54.8	31.3	50.7	34.9	51.9	–	–	–
Tennessee Winter	22	B	4	44.5	95	55.6	31.6	59.6	31.1	–	–	–	–
Folk	32	B	4	42.3	94	–	38.5	47.6	32.6	50.4	–	–	–
Orel	23	B	4	33.3	71	20.2	33.5	46.5	33.2	–	–	–	–
Wisconsin Winter	26	B	4	41.7	89	41.9	34.1	57.1	33.6	–	–	–	–
Tennessee #5	13	H	4	28.3	60	43.3	12.7	17.7	39.5	–	–	–	–
Alaska	19	B	4	46.8	100	62.5	27.7	56.0	41.2	–	–	–	–
Esaw	24	B	4	39.2	84	40.2	34.1	52.8	29.7	–	–	–	–
Poland	36	B	4	44.8	91	–	–	44.4	34.1	53.6	47.3	–	–
W. Va. Sel. #I-34-127	44	B	6	51.9	110	–	–	49.8	47.0	64.6	59.4	56.5	34.2
Missouri Early Beardless	37	H	4	46.7	95	–	–	–	–	51.7	55.7	46.3	33.1
W. Va. Sel. #I-35-274	43	H	4	48.1	98	–	–	–	–	63.3	49.3	45.7	34.3
Wong	46	B	2	35.6	83	–	–	–	–	–	–	41.7	29.5
Smooth Awn #86	41	B1	2	34.3	80	–	–	–	–	–	–	34.3	34.4

* 1936 and 1937 plots destroyed by flood.
** B = bearded (rough); B1 = bearded (smooth); H = hooded.
*** Expressed in percentage of Scottish Pearl grown for the same years.

TABLE 12—Yields per acre for varieties of winter barley grown at Kearneysville for all or part of the period 1933-43*

Variety	W. Va. No.	Head type**	Years tested	Av. yield	Rel. for years grown***	1933	1935	1936	1937	1938	1939	1940	1941	1943
				(bu.)	(percent)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)
Scottish Pearl	28	B	9	24.9	100	20.6	35.6	21.3	33.3	26.2	25.2	12.7	25.8	23.8
Kentucky #1	16	B	9	24.4	98	25.0	37.5	22.4	29.8	33.0	19.4	11.0	26.3	14.8
Kentucky #2	17	B	9	25.2	101	25.1	32.4	21.4	41.7	27.4	21.8	10.1	25.1	22.0
Union	2	B	9	23.0	92	19.8	33.5	17.8	32.4	23.1	15.1	11.5	24.7	28.8
North Carolina Hooded	20	H	9	20.0	80	6.6	32.1	19.1	27.1	25.8	22.5	12.4	22.6	11.9
Tennessee Winter #52	21	B	9	24.5	98	23.3	37.1	21.4	38.2	25.8	20.2	15.3	22.8	16.8
Pidor	27	B	8	24.3	97	13.5	36.6	22.5	29.7	26.5	31.2	12.6	21.6	–
Tennessee #6	25	H	9	18.9	76	14.6	29.8	19.0	23.1	22.2	18.8	10.5	19.7	12.3
Tuckwiller	31	B	8	21.4	84	–	35.7	18.1	31.0	23.7	19.4	13.3	24.0	27.8
Kentucky #11	15	B1	8	24.1	97	25.4	35.7	17.1	30.5	29.4	22.5	9.9	–	22.1
Han River	18	B	7	23.1	92	15.7	33.9	15.2	33.2	32.4	18.3	13.2	–	–
Folk	32	B	6	24.6	96	–	34.9	17.5	35.8	24.8	24.2	10.5	–	–
Tennessee Winter	22	B	6	23.7	88	18.3	29.7	19.5	31.8	21.2	21.8	–	–	–
Orel	23	B	6	26.5	98	24.3	31.9	21.3	33.5	28.2	19.9	–	–	–
Wisconsin Winter	26	B	6	26.3	97	15.7	32.4	25.9	38.8	20.1	24.7	–	–	–
Tennessee #5	13	H	6	21.6	80	17.4	29.8	15.3	22.2	27.5	17.6	–	–	–
Alaska	19	B	6	23.6	87	21.2	33.3	14.0	32.3	21.0	19.8	–	–	–
Esaw	24	B	6	21.4	79	4.9	34.8	12.9	34.6	23.4	17.8	–	–	–
Poland	36	B	4	28.2	125	–	–	–	–	32.6	29.0	17.6	33.7	–
W. Va. Sel. #I-34-127	44	B	5	23.7	104	–	–	–	–	38.1	25.0	9.6	26.1	19.7
Missouri Early Beardless	37	H	3	15.2	73	–	–	–	–	–	–	9.3	21.7	14.7
W. Va. Sel. #I-35-274	43	H	3	16.4	79	–	–	–	–	–	–	12.6	21.9	14.6
Nobarb (Marnobarb)	33	B	1	11.0	52	–	–	11.0	–	–	–	–	–	–
Wong	46	B	1	21.4	90	–	–	–	–	–	–	–	–	21.4
Smooth Awn #86	41	B1	1	30.1	126	–	–	–	–	–	–	–	–	30.1

* Trial winterkilled in 1934 and destroyed by storm in 1942.
** B = bearded (rough); B1 = bearded (smooth); H = hooded.
*** Expressed in percentage of Scottish Pearl grown for the same years.

TABLE 13—Yields per acre for varieties of winter barley grown at Arthurdale for all or part of the period 1936-42*

Variety	W. Va. No.	Head type**	Years tested	Av. yield	Rel. for years grown***	1936	1937	1938	1940	1942	1943
				(bu.)	(percent)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)	(bu.)
Scottish Pearl	28	B	6	26.9	100	20.7	30.3	7.4	27.9	46.4	28.9
Kentucky #1	16	B	6	23.6	88	5.6	10.0	16.8	36.4	40.8	31.9
Kentucky #2	17	B	6	23.6	79	14.8	13.5	9.0	31.3	36.6	22.3
Union	2	B	6	21.2	79	8.1	21.6	6.3	31.1	36.8	23.1
Kentucky #11	15	B1	6	16.1	60	9.0	5.1	12.4	19.8	30.1	20.5
Han River	18	B	4	17.9	83	12.7	22.0	6.1	30.8	-	-
North Carclina Hooded	20	H	6	22.4	83	13.9	20.2	5.9	34.6	38.0	21.7
Pidor	27	B	4	21.6	100	16.0	26.7	6.7	37.2	-	-
Tennessee #6	25	H	6	19.8	74	9.9	20.3	6.5	26.5	30.3	25.1
Tuckwiller	31	B	6	20.4	76	6.6	12.8	7.8	34.4	37.6	23.3
Folk	32	B	4	13.6	63	9.7	14.2	8.3	22.2	-	-
Tennessee Winter #52	21	B	6	24.9	92	19.4	26.9	6.2	33.4	38.4	25.2
Tennessee Winter	22	B	3	17.6	90	18.5	28.5	5.8	-	-	-
Orel	23	B	3	20.1	103	17.1	28.6	14.6	-	-	-
Wisconsin Winter	26	B	3	20.5	105	24.0	31.6	5.9	-	-	-
Esaw	24	B	3	8.4	43	7.0	8.8	9.5	-	-	-
Tennessee #5	13	H	3	21.7	111	24.2	25.8	15.2	-	-	-
Alaska	19	B	3	15.7	80	12.6	27.5	6.9	-	-	-
Poland	36	B	2	18.3	103	-	-	9.5	27.2	-	-
Nobarb (Marnobarb)	33	B	2	4.7	18	3.8	5.6	-	-	-	-
W. Va. Sel. #I-34-127	44	B	4	31.7	115	-	-	7.3	51.4	46.6	21.7
Missouri Early Beardless	37	H	3	26.9	78	-	-	-	29.1	33.2	18.3
W. Va. Sel. #I-35-274	43	H	3	29.5	86	-	-	-	38.9	30.1	19.6
Wong	46	B	2	23.4	62	-	-	-	-	32.8	14.0
Smooth Awn #86	41	B1	2	26.7	71	-	-	-	-	33.9	19.5

* 1939 and 1941 plots failed due to winterkilling.
** B = bearded (rough); B1 = bearded (smooth); H = hooded.
*** Expressed in percentage of Scottish Pearl grown for the same years.

TABLE 14—Yield per acre for varieties of winer barley grown in cooperative farmer trials

Variety	W. Va. No.	Head type*	Years tested	Av. yield	Rel. for years grown**	Pocahontas County Marlinton 1938	Pocahontas County Marlinton 1939	Greenbrier County Lewisburg 1941	Greenbrier County Lewisburg 1942
				(bu.)	(percent)	(bu.)	(bu.)	(bu.)	(bu.)
Scottish Pearl	28	B	4	37.1	100	37.4	52.3	33.0	25.6
Kentucky #1	16	B	4	32.5	88	25.0	49.4	31.0	24.6
Kentucky #2	17	B	4	36.5	98	28.1	58.9	35.1	23.8
Union	2	B	4	36.3	98	28.3	66.2	27.0	23.7
North Carolina Hooded	20	H	4	29.8	80	39.5	36.0	25.1	18.6
Tennessee Winter #52	21	B	4	37.1	100	39.6	52.9	30.6	25.3
Pidor	27	B	3	43.1	105	39.8	60.5	29.1	–
Tennessee #6	25	H	4	29.7	80	33.9	39.5	25.4	20.1
Tuckwiller	31	B	4	38.5	104	27.9	68.4	30.4	27.4
Poland	36	B	3	39.6	97	30.9	57.8	30.0	–
W. Va. Sel. #I-34-127	44	B	4	35.2	95	26.3	54.8	29.1	30.6
Local variety		B	3	33.2	81	35.1	34.3	30.2	–
Kentucky #11	15	B1	3	29.9	78	19.8	42.0	–	27.9
Han River	18	B	2	43.8	98	35.7	54.7	–	–
Tennessee Winter	22	B	2	41.6	93	38.6	47.8	–	–
Folk	32	B	2	40.7	91	23.7	62.2	–	–
Orel	23	B	2	43.7	97	28.0	44.7	–	–
Wisconsin Winter	26	B	2	46.5	104	32.6	60.5	–	–
Esaw	24	B	2	34.5	77	29.5	59.5	–	–
Tennessee Winter #52	13	H	2	37.3	84	36.0	39.7	–	–
Alaska	19	B	2	38.4	74	30.9	51.9	–	–
Missouri Early Beardless	37	H	2	24.8	83	–	–	26.2	22.5
W. Va. Sel. #I-35-274	43	H	2	22.6	77	–	–	26.7	18.5
Wong	46	B	1	19.1	75	–	–	–	19.1
Smooth Awn #86	41	B1	1	23.4	91	–	–	–	23.4

* B = bearded (rough); B1 = bearded (smooth); H = hooded.
** Expressed in percentage of Scottish Pearl grown for the same years.